

REMARKS/ARGUMENTS

The present Amendment and Response comprises Applicants' reply to the Examiner's August 12, 2010 Final Office Action. Claims 1, 2, 31 and 34 are amended. Claims 4-12, 14-15, 20-23, 32, and 35 are currently withdrawn, of which Claims 11 and 35 are currently amended. Claims 13, 16-17 were previously canceled. Accordingly, Claims 1-12, 14-15 and, 18-35 are now pending in view of the above amendments.

Applicants believe that no new matter has been added with regard to the claim amendments provided herein. Applicants do not donate or disclaim any claims or subject matter with the claim amendments made herein, and the Applicants expressly reserve the right to prosecute the original claims or any unclaimed subject matter in one or more future filed continuing applications.

Reconsideration of the application is respectfully requested in view of the above amendments to the claims and the following remarks. Please note that the following remarks are not intended to be an exhaustive enumeration of the distinctions between any cited references and the claimed invention. Rather, the distinctions identified and discussed below are presented solely by way of example to illustrate some of the differences between the claimed invention and the cited references. In addition, the Applicants request that the Examiner carefully review any references discussed below to ensure that Applicants' understanding and discussion of the references, if any, is consistent with the Examiner's understanding. Also, Applicants' arguments related to each cited reference are not an admission that the cited references are, in fact, prior art.

I. Advisory Action Requested

As Applicants file this response within two months of the August 12, 2010 notification date of the Final Office Action, Accordingly, Applicants respectfully request that the Examiner issue an Advisory Action.

II. Allowed Subject Matter

Applicants express their appreciation for the Examiner indicating that independent Claim 1 would be allowable over Sun '231, if that claim were rewritten to require iron (II) nitrate or iron (III) nitrate used as the metal oxide or magnetic oxide precursor. Applicants have rewritten Claim 1 to read as "A method of producing magnetic oxide nanoparticles without using an oxidizing or a reducing agent..." Applicants believe this amendment places Claim 1 in allowable form and requests allowance of Claim 1 and its dependent claims, I.E., Claims 2-12, 14-15, and 18-35

VII. PRIOR ART REJECTIONS

A. Rejections Under 35 U.S.C. § 102(b and e)

The Examiner rejected Claims 1, 18-19, 26-27, 30-31 and 33, under 35 U.S.C. § 102(b) as anticipated by a journal article by Sun et al. entitled "Size Controlled Synthesis of Magnetite Nanoparticles" ("Sun"). The Examiner stated that Sun teaches:

adding an iron precursor to a surfactant mixture of oleic acid (n=17) and oleylamine (n=18) in a phenyl ether solvent (boiling point 258°C) and heated at reflux (i.e. the boiling point of the solvent) for 30 minutes to form Fe₃O₄ magnetic, metal oxide nanoparticles followed by separation;

Fe(AcAc)₃, (an organometallic compound);

6 mmol oleic acid and 6 mm oleic acid and 6 mm oleylamine with 2 mmol iron precursor thus the surfactant is in the solution in an amount of 6 times that of the metal precursor;

20 mL of phenyl ether solvent which is about 126 mmol (density = 1.08 g/cc), thus the solvent is present in an amount of 63 times that of the metal precursor; and

the metal oxide concentration controls the size of the produced nanoparticles inherently.

Additionally, the Examiner stated that although Sun does not make mention, the surfactant concentration (a ratio of surfactants to precursor, solvent, etc.) controls the size of the produced nanoparticles inherently. Whether or not the inventor adjusted the concentration while considering size is immaterial and not considered a process step that limits the instantly claimed invention.

The Examiner rejected Claims 1, 18-19, 26-27, 30-31 and 33, under 35 U.S.C. § 102(e) as anticipated by U.S. Publication No. 2005/0191231 to Sun (“Sun ‘231”). The Examiner stated that Sun ‘231 teaches:

adding an iron precursor to a surfactant mixture of oleic acid (n=17) and oleylamine (n=18) in a phenyl ether solvent (boiling point 258°C) and heated at reflux (i.e. the boiling point of the solvent) for 30 minutes to form Fe₃O₄ magnetic, metal oxide nanoparticles followed by separation;

Fe(AcAc)₃, (an organometallic compound);

6 mmol oleic acid and 6 mm oleic acid and 6 mm oleylamine with 2 mmol iron precursor thus the surfactant is in the solution in an amount of 6 times that of the metal precursor;

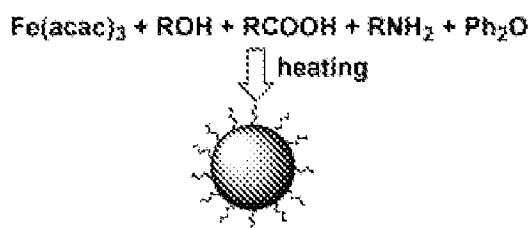
20 mL of phenyl ether solvent which is about 126 mmol (density = 1.08 g/cc), thus the solvent is present in an amount of 63 times that of the metal precursor; and

control of the particle size by adjustment of the stabilizer (amine/acid) to iron ratio (i.e. amount of precursor) which is considered both a concentration of magnetic precursor and a composition ratio of surfacants.

It is well recognized that claims are anticipated if, and only if, each and every element, as set forth in the claim is found in a single prior art reference. Vertegaal Bros. v. Union Oil Co. of Calif., 814 F.2d 628, 631 (Fed. Cir. 1987). Furthermore, “[t]he identical invention must be shown as a complete detail as contained in the . . . claim.” Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236 (Fed. Cir. 1989). See MPEP § 2131. To constitute anticipation, all material elements of the claim must be found in one prior art source. In re Marshall, 198 U.S.P.Q. 344 (C.C.P.A. 1978). Additionally, the elements of the reference must be arranged as required by the claim. In re Bond, 15 U.S.P.Q. 2d 1566 (Fed. Cir. 1999). Applicants respectfully submit that the cited reference does not teach all the materials elements and do not arrange the elements as required by the rejected claim language.

Applicants assert that the present invention disclosed differs from the Sun article and Sun '231. Specifically, the Sun article discloses a method and structure for making magnetite nanoparticle materials by mixing iron salt with alcohol, carboxylic acid and amine in an organic solvent by heating the mixture to 200-360°C. Sun '231 that Fe₃O₄ nanoparticles are made according to the following Scheme 1.

Scheme 1



More specifically, Sun '231 discloses the preparation method of Fe₃O₄ nanoparticles as follows: Fe (acac)₃ (2 mmol) was mixed in phenyl ether (20 ml) with 1,2-hexadecandiol (10 mmol), oleic acid (6 mmol), and oleylamine (6 mmol) in the presence of nitrogen and was heated to reflux for 30min to obtain 4-nm Fe₃O₄ nanoparticles.

According to the preparation method disclosed in the Sun article and Sun '231, each method uses alcohol, which is essential for making Fe₃O₄, as a reducing agent. It partially reducts Fe³⁺ of Fe(acac)₃ to Fe²⁺ to produce Fe₃O₄ (1Fe²⁺, 2Fe³⁺) nanoparticles.

When alcohol is oxidized to aldehyde, it reduces other surrounding materials. Therefore, it has been generally used as a reducing agent for making nanoparticles from metal precursors since the 1990s as described in the journal article (in Nano Structured Materials, Vol. 5, No. 6, pp. 607-613, 1995) for Kurihara et al. entitled "Nanocrystalline Metallicor Powders and Films Produced by the Polyol Method" ("Kurihara").

However Applicants importantly note that the invention disclosed in the present application does not need alcohol, because the present invention does not need a reducing agent or oxidizing agent.

The invention as disclosed by the present application allows Fe₃O₄ to be produced without a reducing agent by choosing one or more appropriate precursors.

Moreover, as described in the Background Art of the present application, the methods of the Sun article and Sun '231 have a disadvantage in that since it is possible to produce the nanoparticles only when using all of three reactants comprising polyalcohol as a reducing agent, organic acid, and organic amine, many types of reactant are used. Particularly in the course of producing ferrite magnetic oxide containing manganese or cobalt, the oxidation number of iron is 3, and the oxidation numbers of manganese and cobalt are both 2. However, if polyalcohol

acting as the reducing agent reduces iron, it is impossible to form ferrite nanoparticles, and chemical equivalence ratios of metals are not in accord with each other, thus the structure of the nanoparticle does not coincide with an inverse spinel structure. Furthermore, due to polyaldehyde and polyorganic acid, caused by a side reaction of polyalcohol as the reducing agent, the action of organic acid as the surfactant is suppressed and a process of separating byproducts is complicated.

In conclusion, the invention as disclosed by the present application does not need alcohol, and thusly can synthesize magnetic or metal oxide nanoparticles without the need for oxidizing agents or reducing agents such as alcohol. Thus, the invention as disclosed by the present application is new and inventive when compared to Sun and Sun '231 and Applicants respectfully request that these rejections be withdrawn.

B. Rejection Under 35 U.S.C. § 103

The Examiner rejected Claims 3 and 33-34 under 35 U.S.C. § 103 as being unpatentable over Sun. The Examiner stated that Sun teaches that metal salts can be from any one of the following salts: Zn, Cu, Ni, Co, Mn and that it would have been obvious to use a common salt such as a nitrate. The Examiner stated that Sun teaches that composite nanoparticles can be made.

The U.S. Supreme Court, in KSR Int'l. Co. v. Teleflex Inc., 82 USPQ 2d 1385, 1391 (2007), reiterated the standard for determining obviousness under 35 U.S.C. § 103 as being the factual inquiries set forth in Graham v. John Deere Co. of Kansas City, 383 U.S. 1 (1966). In Graham, the Court stated that obviousness is determined by first determining the scope and content of the prior art, then ascertaining the differences between the invention, as claimed, and the prior art, and then resolving the level of ordinary skill in the prior art. Against this

background, the obviousness or non-obviousness of the claimed subject matter is determined. Secondary considerations may also be utilized in this analysis to give light to the circumstances surrounding the origin of the subject matter sought to be patented. KSR Int'l Co., 82 USPQ 2d at 1391. When making any obviousness rejection, the Examiner must first acquire a thorough understanding of the claimed invention by reading the specification and claims to understand what the Applicant is claiming as his invention. MPEP § 904.

To establish a *prima facie* case of obviousness under 35 U.S.C. §103(a), the Examiner must clearly articulate the reason(s) why the claimed invention would have been obvious (i.e., the analysis supporting the rejection must be made explicit.) See MPEP § 2142. “Rejections on obviousness cannot be sustained with mere conclusory statement; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” See MPEP § 2142; In re Kahn, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006); see also KSR Int'l Co., 82 USPQ 2d at 1396. To support a 103(a) rejection, the examiner must demonstrate that a person of ordinary skill in the art would have had reason to attempt to make the claimed device, or carry out the claimed process, and would have had a reasonable expectation of success in doing so. See Noelle v. Lederman, 355 F.3d 1343, 1351–52 (Fed. Cir. 2004); Brown & Williamson Tobacco Co. v. Philip Morris, Inc., 229 F.3d 1120, 1121 (Fed. Cir. 2000); see also KSR Int'l Co., 82 USPQ2d at 1391.

Applicants traverse the Examiner’s rejection for obviousness for at least the above-listed reasons. Additionally, the prior art reference cited does not teach the invention as disclosed in the present application. Applicant respectfully requests withdrawal of this rejection .

CONCLUSION

In view of the foregoing, Applicants believe the claims as amended are in allowable form. In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, or which may be overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

Applicants believe no fees are due for this submission. However, please credit any over payment or debit any under payment to Deposit Account No. 08-2665.

Respectfully submitted,

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